fats seems destined to assume as many shapes as Proteus. At first the globose forms, obtained by the boiling and subsequent slow cooling of butter, and exhibiting the Saint Andrew's cross under polarized light, were brought prominently forward as distinguishing marks of pure butter. Prof. H. H. Weber, however, upon testing the method as described by Dr. Taylor, found, that, although the so-called butter crystals could be readily prepared from butter, they could be as readily prepared from beef-fat, or mixtures of beef-fat and lard, under like conditions. The necessary conditions are, the slow cooling of the melted fat in the presence of minute solid particles about which the fat may crystallize, the so-called 'butter crystals' being aggregations of minute crystals radiating from a centre. In the test as described by Dr. Taylor, the butter is boiled for one minute, and then slowly cooled. During the boiling, some of the water of the butter evaporates, and a corresponding portion of its salt solidifies, and the minute crystals thus formed serve as centres of crystallization for the fat during the subsequent cooling.

After the publication of these results, the 'butter crystal' and its Saint Andrew's cross were relegated to a subordinate position, and in several publications Dr. Taylor insisted that his most important test had been neglected, viz., the appearance of the unboiled material under polarized light with a selenite plate. According to Dr. Taylor, butter shows a uniform tint, while lard and tallow show prismatic colors. Here, again, however, he has been pursued by Professor Weber, who shows that either butter-fat or lard or tallow, when cooled quickly, will show a uniform tint, while if cooled slowly, so as to admit of the formation of larger crystals, prismatic tints are shown by both. Since imitation butter is cooled rapidly when made, and since both genuine and imitation butter are liable to undergo sufficient changes of temperature after manufacture to allow of a partial re-crystallization, the test is plainly fallacious. Apparently, Dr. Taylor prepared his annual report with these results in mind, for there, and in his paper before the annual meeting of the American society of microscopists at Chautauqua, Aug. 10–16, he gives his method a still different exposition.

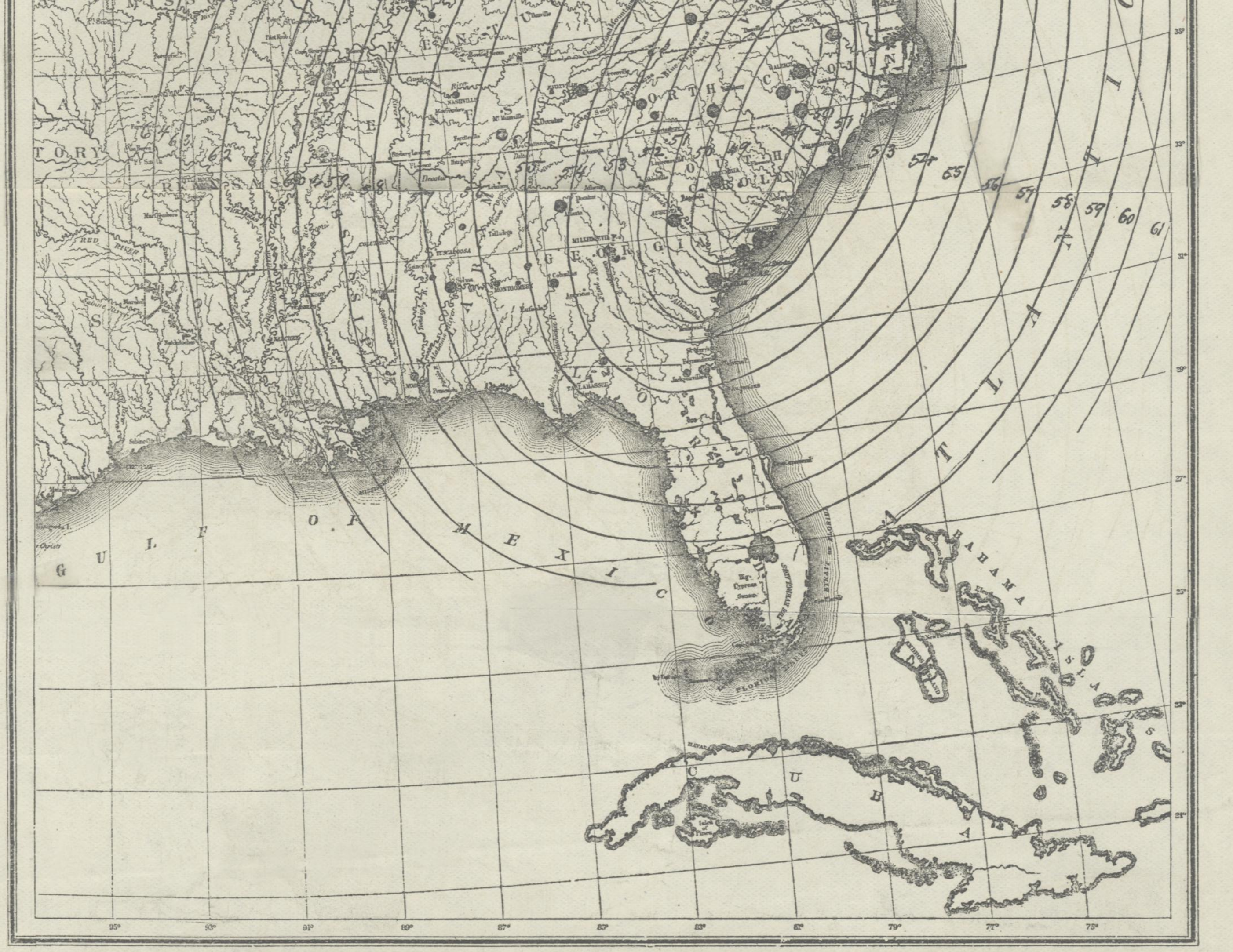
Dr. Taylor's first step is now to search for fat crystals in the test sample by plain transmitted light. By the application of polarized light, 'amorphous crystals,' whatever these may be, may be detected. To determine whether these 'amorphous crystals' are of beef-fat or lard, the sample is boiled and slowly cooled, as already described, and mounted in oil. Under these conditions, he now finds, in accordance with Professor Weber, that butter, lard, and beef-fat all give globular crystalline bodies which (apparently with the exception of lard) show the Saint Andrew's cross. These bodies are to be distinguished by their forms, lard giving a stellar form, butter the well-known 'butter crystals,' and beef-fat a stellar form with biserrated spines. Dr. Taylor has also discovered the noteworthy fact that Tennessee butter of a certain grade yields globules which are flattened or indented on one side! The above account of Dr. Taylor's method, as at present described by him, is drawn mainly from his last annual report to the commissioner of agriculture, —his Chautauqua paper, to judge from the published abstract, having been chiefly a criticism on Professor Weber's experiments. We shall endeavor to keep our readers informed of the changes which the method undergoes in the future.

THE EARTHQUAKE OF AUG. 31, 1886.

THE accompanying map has been hastily compiled from the great mass of conflicting data from all sources now available, and probably gives a fair general idea of the origin of the shock, the limits of the area disturbed, and the intensity at many points within this area (plotted on the American scale of intensity, 1 to 5). It will be readily appreciated by every one that in this preliminary report all that is or can be arrived at is to give a general outline, as determined by the most probable evidence at hand, to serve as a good working hypothesis: to attempt any thing further at present would be to make a mere pretence at accuracy.

A line of weakness in the earth's crust extends from Troy, N.Y., south-westward, along the line of tidewater, past Baltimore, Washington, and Richmond, losing itself in a broad flexure south of Raleigh. The cause of the shock seems to have been a renewed faulting or displacement along the line where it crosses the Carolinas. This severe shock appears to have had its origin along this line in central North Carolina and eastern South Carolina, at 9.49 P.M. (75th meridian time), Aug. 31. It was not without warning. For a long time slight shocks have been occasionally felt in North Carolina, and only a few


NEW BRUNSWICK
PROVINCE OF QUEBEC
PROVINCE OF ONTARIO



THE CHARLESTON EARTHQUAKE.

SCIENCE, *September* 10, 1886.

The co-seismal lines give the even minutes after 9 P.M. (75th meridian time).

Scale of intensity, 1 to 5.

+ indicates that the shock was unimportant, or not felt.

Diameter of circles (in ½ mm.) gives American scale of intensity (1 to 5).

days previously moderate shocks were felt near Charleston. From the Carolinas it radiated with great rapidity (from 20 to 60 miles a minute) throughout the great area bounded on the south by the Gulf of Mexico; on the north by Michigan, the province of Ontario, New York, and southern New England; on the east by the Atlantic ocean, where it was probably felt nearly 500 miles at sea; and on the west by the central Mississippi valley. The limits are, so far as now known, as follows: central Florida; eastern Louisiana, Arkansas, Missouri, and Iowa; southern Michigan and province of Ontario; northern New York; and southern New England. It was not felt at Bermuda. The limits of the shock, as here stated and as indicated in the accompanying map, it is particularly desirable to verify, as well as the correct time at which the shock was first felt at all points within the disturbed area. It often happens that there are places within an earthquake area where the shock is not perceptible, owing probably to some local peculiarity in the geological formation, although decidedly noticeable at places not far away. There are already points of this kind mentioned, — in Florida, Indiana, and Connecticut, for instance, — and such information is very interesting.

The hypothesis has been advanced by Perrey that earthquakes are connected with subterranean tides due to the combined influence of the sun and moon, and analogous to those in the ocean. At a given point the earth's strata are under the accumulated tension of centuries, and this pressure is slowly but steadily increasing, until it reaches a point when fracture is imminent. Twice a day the great oceanic tidal waves sweep along the coast, the tremendous changes of pressure due to them being possibly augmented by analogous movements beneath the crust; and at a critical moment they add 'the last straw' that determines the fracture. It is very interesting to notice in this connection that at the time of the severe shock at Charleston this tidal influence was at its maximum. The moon was in perigee at 2 A.M., Aug. 29; new moon at 8 A.M. the same day, acting in a direct line with the sun (the eclipse of the sun occurred at 5 A.M., Aug. 29): extremely high tides occurred, therefore, for several days following. The moon's upper transit at Charleston occurred at 2.22 P.M., on Aug. 31. The high tide following (the higher of the two daily tides) was at 9.35 P.M., just twenty minutes before the shock occurred. This remarkable coincidence is of course extremely interesting.

It seems remarkable that no sea-wave followed the shock; and indeed it was providential that it did not, as the resulting destruction and loss of life would have been a hundredfold greater. A sea-wave (often very incorrectly called a tidal wave) of greater or less size is the almost invariable accompaniment of a severe shock occurring near the seacoast.

It is unnecessary to enlarge here and now upon the general effects of this severe earthquake, or to theorize upon the causes of earthquakes in general or of this one in particular, more than has already been done. Such a study, to be of any value, must await the compilation and elaboration of a vast amount of material, and the final reports of the geologists who are now at work in the region of greatest disturbance.

STUDY OF THE EARTHQUAKE.

THE U. S. geological survey has undertaken to make a study of the severe earthquake of Aug. 31, which caused such great destruction and loss of life at Charleston, S.C. It was the most severe on record in the United States, both as to the effects produced and the area disturbed.

The study of phenomena of this kind is of the greatest value to science as a guide to the knowledge of the nature of the interior of the globe, and in its bearing upon every branch of physics and geology. In it there is needed a vast amount of reliable information, not only from points within the disturbed area, but also from adjacent points, in order to accurately define its limits; and it is not only skilled observers who can furnish such information, but almost every one can contribute valuable facts. It is therefore confidently hoped that facts of interest will be sent in at once to the U. S. geological survey at Washington while they are still fresh in the memory. Newspapers can render great assistance by giving wide publicity to this call, and by sending copies of their issues containing information about the local effects of the shock. Attention to the points mentioned below will add greatly to the value of the information, and facilitate its elaboration and study.

Write on one side only of the paper. After dating the letter as usual (giving also the locality where the observation was made, if not the same), write 'Answers to circular No. 2.' State the observer's situation (whether in the house or out of doors, up stairs or down, sitting, standing, walking, reading, etc.); also, if possible, the character of the ground (whether rocky, earthy, sandy, etc.) Then answer the following questions, referring to them by number only: —

1. Was an earthquake felt at your place the evening of Aug. 31, 1886, or within a few days of that time? Negative answers to this will be of great